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COUNTRY Yugoslavia

SUBJECT Survey of the Chemical Industry

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1. "Yugoslavia is at present going through a far-aiming industrial development which may in a relatively short time transform this previously essentially agricultural country into a relatively well industrialized one. Along with the mining and metallurgic industries, the chemical industry of the country is rapidly growing.
2. "Opportunities for establishing a chemical industry in Yugoslavia, a country of 16.5 million people, have always existed, as the land is one of the richest of Europe in natural resources. It has great deposits of lignite, pyrites, bauxite, and the like, and could develop its hydroelectric resources hundredfold. But it is only during the past few years that such work has been started on a large scale.
3. "Soon after World War II manufacture of alumina and aluminum was developed, followed a few years later by that of plastic materials, artificial rubber, and polyvinyl.
4. "Before World War II, several chemical plants already existed in Yugoslavia producing sulphuric and hydrochloric acids, soda ash, caustic soda, calcium carbide, copper sulphate, artificial fertilizers and soap.
5. "During World War II, the larger number of these plants were exposed to extensive destruction and damages, removal of machines and equipment. By 1947, however, almost all the pre-war plants had been repaired, but the new equipment promised by the Soviets never arrived. It was only after the break with Moscow in 1948,

that the industry was able to really modernize its plants. Today, an array of chemical products never before manufactured in the country are being produced: technical chemicals for industry, mining and metallurgy; plant protection products; auxiliary products for textile, leather and rubber industries; pure chemicals for industrial laboratories, plastics, including bakelite and polyvinyl, abrasives, etc. Of these products, polyvinyl chloride and various technical chemicals are already being exported, though as yet in small quantities.

6. "In view of the large number of products manufactured in the country, and of their

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heterogeneous character. The production cannot be reduced to a single index.

7. Sulphuric acid; Production of this basic element has been pushed as much as possible, reaching nearly three times the pre-war output in 1953. This product is however still scarce in Yugoslavia, and new plants are under study in order to increase the production to fully meet the domestic market demands, especially for greater artificial fertilizer manufacture. The industry uses rich pyritic ores, as well as great quantities of pyrite obtained as by-product in the metallurgic industry.
8. Caustic soda and soda ash plants still use the old pre-war installations. The production is however, considerably greater than before World War II, as formerly the existing capacities were not fully used. The position is similar with caustic soda, where an improved use of old production capacities in Bosnia and Hercegovina (Soda Works at Lukavac, and Elektrobosna Works at Jajce) and the newly built Jugovinil Plant in Kastel Sućurac on the Adriatic coast of Croatia, have made possible an increase of production of 40% over the pre-war output. Soda, moreover, is an important item in Yugoslav exports. Under the newest development plan to be implemented with Western democracies' help, a considerable increase in the production of soda is foreseen, both to meet the future needs of the country's new industries - glass, sodium salts, soap, soap paper, cellulose, artificial fibres, dyes, aluminum, textiles, etc - and to increase present exports.
9. Hydrochloric acid also shows an increased production capacity as compared to the pre-war (1939) figure - almost four times as much.
10. Chlorine. Production trebled with the erection of the large Jugovinil Works. [See paragraph 37].
11. Production of superphosphates is coupled with an extended production capacity of sulphuric acid. An increased output will therefore be reflected only during the present year, and will steadily increase with the greater quantities of domestic sulphuric available year after year.

Production indexes

12. "The following indexes for the key products of the chemical industries, in percentages, roughly indicate the change so far obtained in production in comparison with 1939:

Product	1939	1952
Sulphuric acid	100	230
Hydrochloric acid	100	500
Soda ash	100	150
Caustic soda	100	140
Calcium carbide	100	63
Copper sulphate	100	112
Artificial fertilizers	100	96
Soap 60%	100	182

13. "It is to be explained that the decline in the production of calcium carbide is the result of the former system of distribution of electric power to industrial plants, under which certain branches enjoyed a priority in the supply. The carbide industry was not among these branches, and received electric power only when the other branches had been supplied. With the building of large hydroelectric power plants, now nearing completion, the carbide industry will be in a position to obtain all the necessary electric power and its production will increase substantially. The production index decline of artificial fertilizers in the post-war years is the result of the shortage of sulphuric acid for the production of superphosphates, and of the shortage of electric power for the production of nitrogen fertilizers.
14. "The sulphuric acid production index for 1952 would have been much higher, had it not been for the interruption of operations in the Zorka Works at Šabac, due to their enlargement. Generally speaking, the 1953 index should be considerably higher than the 1952 one. The whole industry being still in a growing stage.

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Future development

15. "The further development of the basic chemical industry is linked with the development of the metallurgical combine for the production of copper and with the utilization of sulphide ore waste in Trepča, one of the largest lead-zinc mines of Yugoslavia. Once completed, sometime in 1954, these works will do much to facilitate an increased production of sulphuric acid.
16. "Simultaneously, new large coal mines will be opened, coke works now under construction will be completed, plants for the production of nitrogen fertilizers will be built, utilizing by-products of coal and gas from the coke works. Using tar from the gas works, the industries of organic dyes, plant protection products, plastics drugs and other chemicals will be developed.
17. "Although the target of the increased production of superphosphates made possible by the completion of plants under construction is considerable in comparison with the former output (the annual average production amounted to some 40,000 metric tons), it is not nearly sufficient to meet the needs of Yugoslav agriculture. Already in 1949, these needs were estimated at 350,000 tons of artificial fertilizers, of which 290,000 tons were superphosphate. Yet these needs have been set very low: calculating with an average of 35 kilograms of phosphoric acid per hectare (2.5 acres) of arable land, the 6,500,000 hectares of Yugoslav arable land would require 227,500 tons of phosphoric acid. Or, if this quantity is reckoned in normal 16% superphosphate, Yugoslavia would need 1,422,000 tons of superphosphate a year.
18. "In 1953, the Yugoslav superphosphate production capacity will be increased by 80% and in the course of 1954 by 165% as compared with the former capacity. A further increase of the production capacity of superphosphate could be obtained by using the sulphur dioxide gases produced in the new copper foundries as a by-product. If all goes well and according to plan, Yugoslavia will have a total production capacity of superphosphate of 694,000 tons per year at the end of the first phase of development, and of 1,700,000 tons in the second phase.
19. "The position with nitrogen fertilizers is as follows: For the present, of these fertilizers only calcium cyanamide is produced at Ruše and Dugi Rat in the amount of 20,000 tons annually. The Coke Works at Lukavac and Zenica, now under construction, will produce a further 20,000 tons annually. In order to satisfy the proportion of superphosphates to nitrogen fertilizers (1:0.6) it would be necessary to build during the first phase new plants using lime ammonitrate for an annual production of 400,000 tons. To attain this it would be necessary to build three new factories for nitrogen fertilizers in the first stage, and five or six in the second stage, increasing thus the total capacity to a total of 1,100,000 tons a year. These factories would use small size lignite, coke gas and earth gas. Lignite and coke gas would have to be used at first, until the reserves of earth gas, not yet definitely studied, can be utilized. One factory would be built to use the Kolubara lignite, one the Kosovo, and the third the Kičevo lignite. In the second stage, the erection of nitrogen compounds factories in Croatia, Slovenia and Montenegro is planned.
20. "Among other plans for the immediate future is that of a viscose plant to produce cotton and wool type artificial staple fibres, artificial silk (rayon) and cellophane. The requirements of this new industry will be covered by a cellulose and carbon disulphide plant, yet to be built, while the supply of other materials (sulphuric acid, caustic soda, chlorine) will be ensured by the plants already under construction at present. When the viscose plant begins operating, the imports of textile raw materials will be reduced by several million dollars per annum.
21. "Preparations are also made to develop acetylene production. This industry will use domestic calcium carbide as its raw material. The latter will be obtained from limestone and coke, as a reductor, and electric power. The setting up of such new plants thus will depend on the completion of the new hydroelectric and lignite-electric power plants now under construction.
22. "In addition to the above mentioned products, there is still a whole series of other chemicals which will be produced in the future, conditions permitting. The order of their development will depend on continued peace and foreign help, needs of the country, and economic feasibility of the production itself in each case.

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Cellulose

23. "For years, Yugoslavia exported all types of timber and wood for further chemical processing. But it is only in the course of the last two years that the country was able to assert its position in the foreign markets as an exporter of wood pulp.
24. "Wood pulp used to be produced in Yugoslavia in the Drvar Woodpulp Works before World War II, but the plant was completely destroyed during the war. After World War II, it was decided to completely reorganize such production, not only to cover the increased needs of the country, but also to allow a substantial export surplus, in view of the constantly growing demand for this product all over the world.
25. "Thus a large sulphite cellulose plant was built after World War II at Prijedor, in the immediate vicinity of the large forests of middle and North Bosnia. It uses the water power of the Sana River, on whose banks it is erected, and which has sufficient water throughout the year. Deposits of limestone are in the immediate vicinity, while large deposits of suitable coal as well as pyrite ores are not far away. The production is based on burning pyrite ore and sulphur. Thanks to a skilled technical staff, formed partly in the Drvar Works before World War II, and partly in foreign wood pulp works after the war, Yugoslav wood pulp can compete with good quality wood pulp.
26. "For the present, the Prijedor Woodpulp Works produce only unbleached sulphite wood pulp. However, within a few months, the foreign markets will receive bleached sulphite, as the bleaching plant is almost completed. The chemicals needed for bleaching are produced in sufficient quantities by domestic chemical works.
27. "At the same time as the operation of the bleaching plant begin, the second half of the Prijedor works will be completed; at present they operate only at half capacity, though they are already exporting several thousand pounds yearly. At completion, the export surplus will be increased by about three times.
28. "Export marketing opportunities will then be much greater, use of bleached wood pulp being more widespread than use of the unbleached product.
29. "Yugoslav unbleached sulphite wood pulp is marketed in four brands, of which the first three are of a normal bright color, and the fourth grayish:

The Ia (prima) brand contains a maximum of 100 splinters of the size of 0.5 to 2 mm, and a maximum of 100 splinters under 0.5 mm per square meter.

The IIa (secunda) brand contains a maximum of 200 splinters of large-size splinters (dimensions as above) and 1000 to 6000 splinters small splinters.

The IIIa (tertia) brand contains respectively up to 600 and 6,000 to 10,000 splinters.

The IVa (quarta) brand contains respectively more than 600 and more than 10,000 splinters.

The Bjorkman number for the first three brands is 90° to 100° (normal). Air dryness amounts to 0 : 100. The prices are calculated on this basis.

30. "The exporters of unbleached wood pulp ('Šipad' of Sarajevo, and 'Hempro' of Belgrade) have up till now been marketing this commodity

Drugs

31. "Before World War II, the pharmaceutical industry could only cover some 10% of the country's needs in drugs. After World War II, the existing laboratories and plants were organized into four main factories, the 'Alkaloid' at Skopje, the 'Pliva' and 'Pionir' at Zagreb, and the 'Lek' at Ljubljana. Later on, three more factories were

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set up, the 'Galenica' at Zemun, the 'Prolek' at Belgrade and the 'Bosnalijek' at Sarajevo, with the result that the Yugoslav pharmaceutical industry can now cover 80% of the country's needs.

32. "In addition to the products produced before World War II, 150 new products are now being made. To mention only a few: penicillin; various sulphonamides; serums and vaccines, pharmaceutical and non-organic salts, pure chemicals, etc.
33. "Among Yugoslav products exported, the most important are: opium alkaloids; organo-therapeutical preparations, serums, vaccines; toxins; various glucosides; bismuth salts; mercury and silver salts and dental products.

Other new products

34. "Besides the above-mentioned, the Yugoslav chemical industry is now manufacturing the following products, which were not produced before World War II in its territory:

aluminum sulphate
magnesium hydroxide
pyrosulphite
sodium sulphite
barium chlorate
lead arsenate
barium carbonate
hydrogen and many others.

New chemical plants already working:

35. "A large plant for the manufacture of plastic masses based on polyvinyl chloride, the 'Yugovinil' in Kastel-Sućurac, described below;
- 'Fotokemika' in Zagreb, for the manufacture of photographic paper, photographic chemicals and the like;
- the Sombor plant for the manufacture of cinematographic film;
- the Skoplje nicotine plant for the industrial utilization of tobacco remnants;
- the Organic Dyes plant at Celje, producing the dyes needed by the textile, leather and other industries;
- the 'Kotroman' plant at Dobrun, which manufacture turpentine-based products;
- the 'Radonja' plant at Sisak for the production of tartaric acid; and many smaller ones.

New Plants under construction:

36. "At present still under construction are:
- New installations for the production of sulphuric acid at the 'Zorka' plant in Šabac;
- a zinc electrolyzing plant, also at Šabac;
- a plant for the manufacture of caustic and calcinated soda and for salt electrolysis at Lukavac;
- a plant for nitric compounds at Goražde; and
- a plant for chrome and ferro-silicium compounds at Skopje.

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The 'Yugovinil' Polyvinyl Chloride Plant

37. "This plant, completed in 1950, is the greatest pride of the new Yugoslav Chemical Industry. Located on the Adriatic Sea shore, not far from Split (Spalato) it is one of the most modern of its kind. It benefited from the latest technical experience in this field all over the world. Many of its engineers and skilled workers have learned their trade in the largest and most modern plastic plants of Europe. Thanks to this, and to the most modern machinery available at the time of the plant's inauguration, the 'Yugovinil' Works today are in a position to produce polyvinyl chloride that equal the best foreign products, and also to export part of its production. 50X1-HUM
38. "Yugoslav polyvinyl chloride is marketed in three basic forms: powder; granulated; paste. However, the works produce mainly powder, in the four following types:
- | | | | |
|----------------|-----------|-------|--|
| Jugovinil 505, | value 'K' | 63-65 | for stiff, hard products. |
| Jugovinil 606 | " | 68-71 | for soft flexible products |
| Jugovinil 707 | " | 68-71 | for the production of polyvinyl paste. |
| Jugovinil 808 | " | 70-75 | for electric cable coating. |
- Apart from these basic standard types, the Jugovinil Works can manufacture other types with a lesser or higher 'K' value, for special purposes.
39. "Besides powder, the Jugovinil Works also export granulated polyvinyl chloride containing the necessary chemical admixtures required for the immediate processing into the final product. Countries with a developed chemical industry prefer to purchase Yugoslav polyvinyl chloride powder the ready granulated product for the direct manufacture of a large number of consumer articles is usually preferred. 50X1-HUM
40. "Yugoslav polyvinyl chloride has already been marketed in fairly large quantities. In spite of the keen competition reigning in the world market the Soviet Zone of Germany the new product seems to have met with favorable reception everywhere". 50X1-HUM

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